

Real Time Snow Water Equivalent (SWE) Simulation April 11, 2012 Sierra Nevada Mountains, California

Introduction

This report is a beta product and subject to revision. We have developed a real-time SWE estimation scheme based on historical SWE reconstructions between 2000-2009 and daily in situ SWE measurements for the Sierra Nevada in California. Real-time SWE will be released on a weekly basis during the maximum snow accumulation/ablation period.

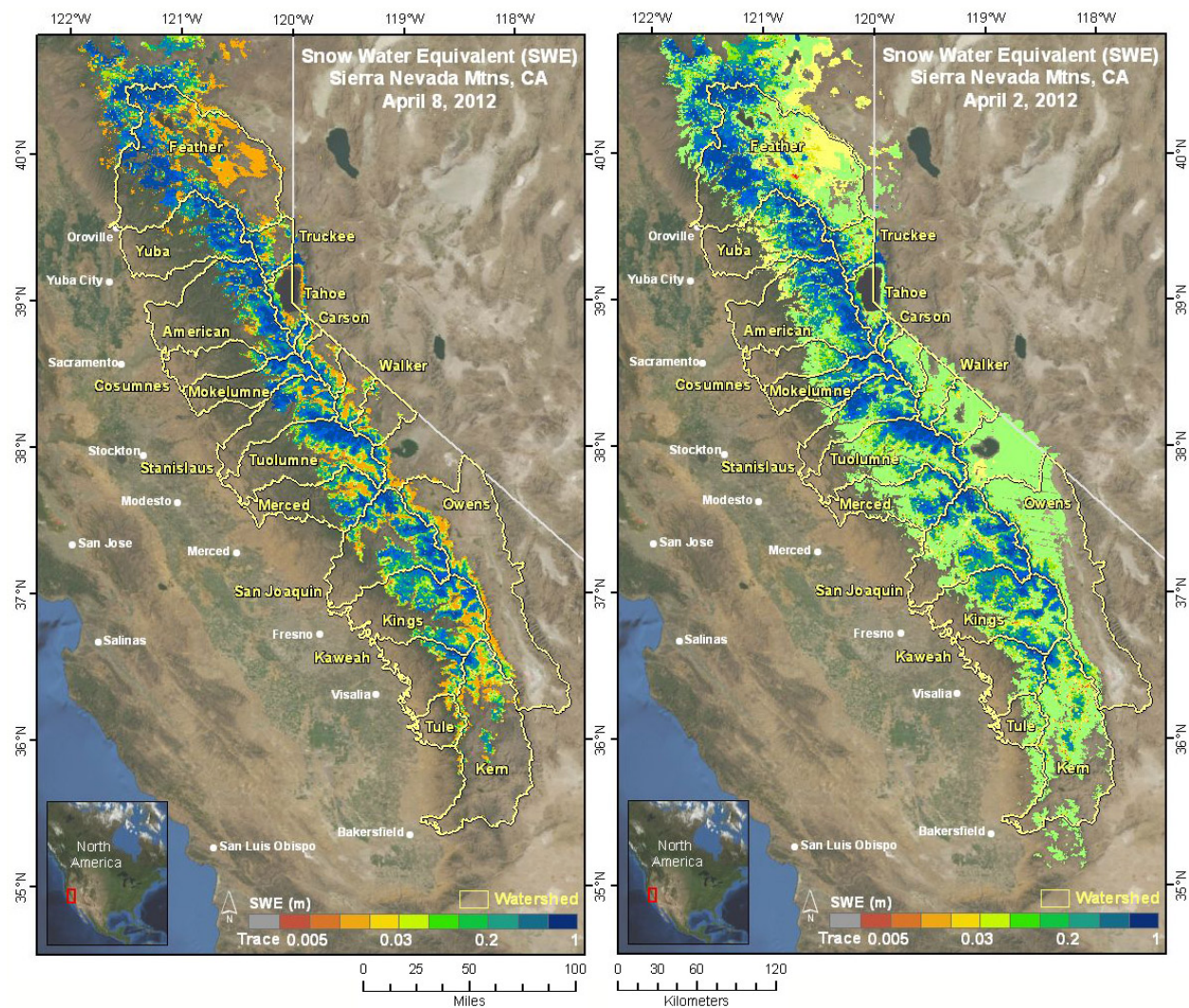


Figure 1. SWE amounts for April 8, 2012 are shown on the left and SWE amounts for April 2, 2012 are shown on the right.

Discussion

The most recent cloud-free MODIS image available is for April 8, 2012. Figure 1 shows SWE amounts for April 8, 2012 on the left and SWE amounts for April 2, 2012 on the right. Note the increased depth of SWE between April 2, 2012 and April 8, 2012 and marked decreased extent. Most watersheds are affected by the increased snowpack. Figure 2 shows the percent of average SWE for April 8, 2012 for the snow-covered area on the left. Note that all areas have a higher % of average from last week. On the right is percent of average for April 8, 2012 shown by watershed. Table 1 shows the average SWE by watershed for 4/8/2012, 4/2/2012, the percent of average for 4/8/2012 and the change between 4/2/2012 and 4/8/2012 for all areas above 3000 feet.

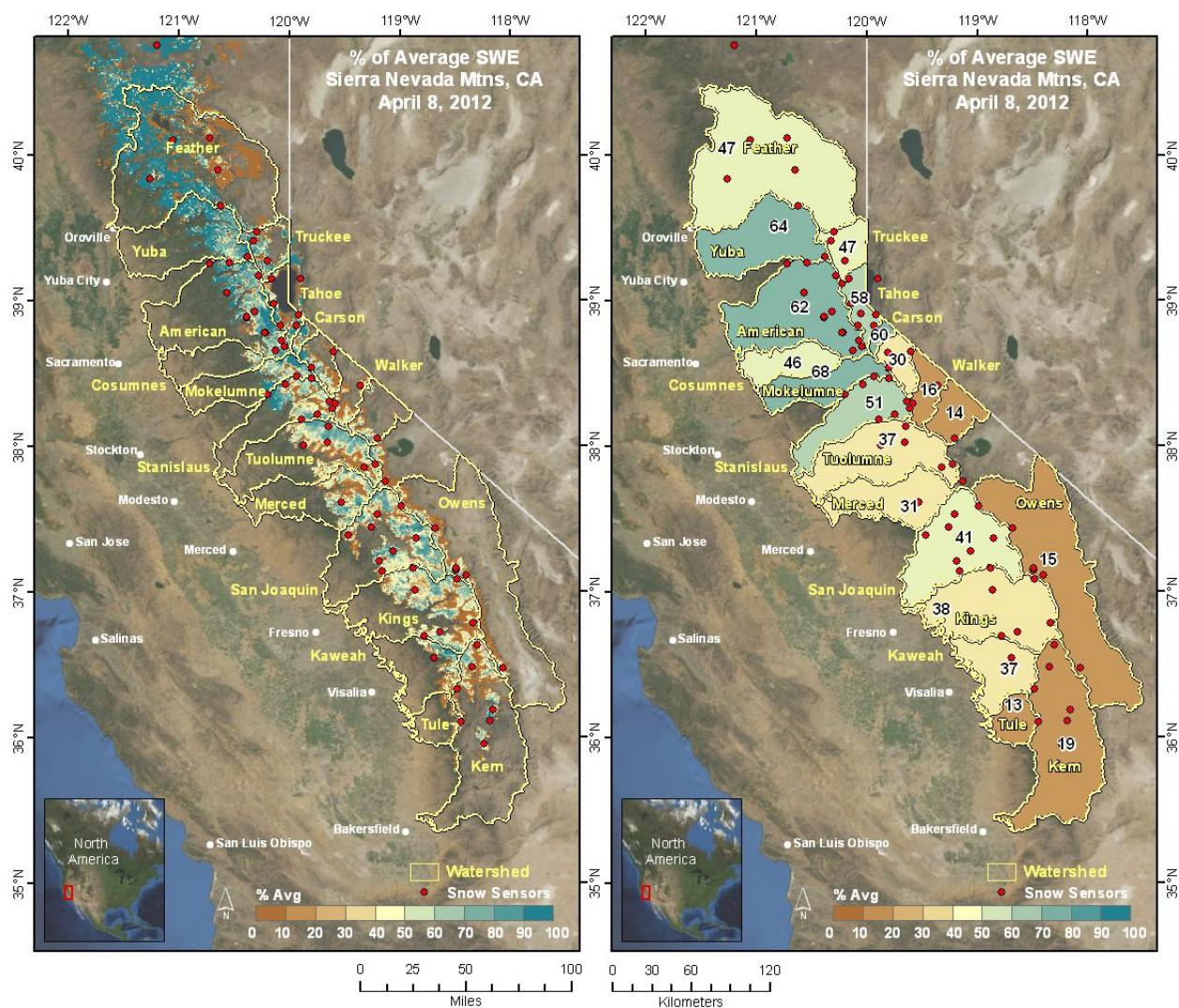


Figure 2. Percent of average SWE for April 8, 2012 for the entire Sierra (on left) and by watershed (on right).

Methods

Results for the week of April 11, 2012 are based on April 8, 2012 real-time data from 75 in situ SWE measurements distributed across the Sierra Nevada, one Moderate

Resolution Imaging Spectroradiometer (MODIS)/Terra Snow cover daily cloud-free image, a normalized reconstructed SWE image for March 1, 2006, and an anomaly map based on 10 years of modeled SWE (2000-2009). We are exploring other avenues to remedy the problem of when a cloud-free MODIS image is not available to produce a real-time SWE product. Relative to snow stations and the NWS SNODAS product, the reconstructed SWE product correlates strongly with full natural flow, especially late in the snowmelt season (Guan, et. al.).

Table 1. Mean SWE above 3000 feet for 4/8/2012, shown by watershed.

| Watershed | 4/8/12 SWE (in) | 4/8/12 % Avg to Date | 4/2/12 SWE (in) | 4/2 thru 4/8 Change in SWE (in) |
|------------------------|--------------------|-------------------------|--------------------|------------------------------------|
| AMERICAN | 20.78 | 68.89 | 15.56 | 5.22 |
| FEATHER | 15.29 | 57.78 | 11.17 | 4.13 |
| KAWEAH | 10.98 | 42.12 | 8.88 | 2.10 |
| KERN | 6.87 | 32.35 | 3.71 | 3.16 |
| KINGS | 11.87 | 42.23 | 10.02 | 1.85 |
| TAHOE | 17.40 | 58.81 | 17.61 | -0.21 |
| MERCED | 12.67 | 43.37 | 8.19 | 4.48 |
| OWENS | 6.49 | 25.99 | 2.88 | 3.61 |
| SAN JOAQUIN | 15.65 | 51.18 | 11.74 | 3.91 |
| STANISLAUS | 17.63 | 54.04 | 14.32 | 3.31 |
| TRUCKEE | 14.39 | 57.64 | 11.26 | 3.13 |
| TUOLUMNE | 16.29 | 46.10 | 10.80 | 5.49 |
| YUBA | 22.05 | 76.09 | 16.17 | 5.88 |
| COSUMNES | 11.59 | 51.93 | 5.33 | 6.25 |
| MOSELUMNE | 22.23 | 69.08 | 17.09 | 5.14 |
| TULE | 3.00 | 20.57 | 1.83 | 1.17 |
| WEST WALKER RIVER | 8.50 | 27.47 | 4.57 | 3.93 |
| EAST WALKER RIVER | 10.13 | 37.79 | 3.45 | 6.68 |
| WEST FORK CARSON RIVER | 14.36 | 67.55 | 13.11 | 1.25 |
| EAST FORK CARSON RIVER | 9.96 | 42.66 | 6.82 | 3.14 |

Current Meteorology

Between April 2nd and April 8th, 2012, four inches of snow fell in Alpine Meadows and no snow fell in the Mammoth area. This week into the weekend should see cold temperatures, particularly cold for April, and up to 3 feet of colder snow which should raise the snow ratios.

References

Guan, B., N. P. Molotch, D. E. Waliser, S. M. Jepsen, T. H. Painter, and J. Dozier: Snow water equivalent in the Sierra Nevada: Blending snow sensor observations with snowmelt model simulations. Submitted to *Water Resour. Res.*

Hall, Dorothy K., George A. Riggs, and Vincent V. Salomonson. 2006, updated daily. *MODIS/Terra Snow Cover Daily L3 Global 500m Grid V005*, March 4, 2012. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.